NAVY
SBIR FY06.3 PROPOSAL SUBMISSION INSTRUCTIONS

The responsibility for the implementation, administration and management of the Navy SBIR program is with the Office of Naval Research (ONR). The Director of the Navy SBIR Program is Mr. John Williams, williajr@onr.navy.mil. For general inquiries or problems with electronic submission, contact the DoD Help Desk at 1-866-724-7457 (8AM to 5PM EST). For program and administrative questions, please contact the Program Managers listed in Table 1; **do not** contact them for technical questions. For technical questions about the topic, contact the Topic Authors listed under each topic on the website before **13 September 2006.** Beginning 13 September, the SITIS system (http://www.dodsbir.net/Sitis/Default.asp) listed in section 1.5c of the program solicitation must be used for any technical inquiry.

TABLE 1: NAVY ACTIVITY SBIR PROGRAM MANAGERS POINTS OF CONTACT

Topic Numbers	Point of Contact	Activity	Email
N06-166 thru N06-170	Mrs. Janet McGovern	NAVAIR	janet.mcgovern@navy.mil
N06-171 thru N06-186	Ms. Janet Jaensch	NAVSEA	janet.l.jaensch@navy.mil
N06-187	Mrs. Cathy Nodgaard	ONR	nodgaac@onr.navy.mil

The Navy's SBIR program is a mission-oriented program that integrates the needs and requirements of the Navy's Fleet through R&D topics that have dual-use potential, but primarily address the needs of the Navy. Companies are encouraged to address the manufacturing needs of the Defense Sector in their proposals. Information on the Navy SBIR Program can be found on the Navy SBIR website at **http://www.onr.navy.mil/sbir**. Additional information pertaining to the Department of the Navy's mission can be obtained by viewing the website at **http://www.navy.mil**.

PHASE I GUIDELINES

Follow the instructions in the DoD Program Solicitation at **www.dodsbir.net/solicitation** for program requirements and proposal submission. It is recommended that cost estimates include travel to the sponsoring activity's facility at the end of the phase I. The Navy encourages proposers to include, within the 25 page limit, an option which furthers the effort and will bridge the funding gap between Phase I and the Phase II start. Phase I options are typically exercised upon the decision to fund the Phase II. For NAVAIR topics N06-166 thru N06-170 the base amount should not exceed $80,000 and 6 months; the option should not exceed $70,000 and 6 months. For all other Navy topics the base effort should not exceed $70,000 and 6 months; the option should not exceed $30,000 and 3 months. **PROPOSALS THAT HAVE A HIGHER DOLLAR AMOUNT THAN ALLOWED FOR THAT TOPIC WILL BE CONSIDERED NON-RESPONSIVE**.

The Navy will evaluate and select Phase I proposals using the evaluation criteria in section 4.2 of the DoD solicitation in descending order of importance with technical merit being most important, followed by the qualifications, and followed by commercialization potential. Due to limited funding, the Navy reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

One week after solicitation closing, email notifications that proposals have been received and processed for evaluation will be sent. Consequently, e-mail addresses on the proposal coversheets must be correct

The Navy typically awards a firm fixed price contract or a small purchase agreement for Phase I.

PHASE I SUMMARY REPORT

In addition to the final report required in the funding agreement, all awardees must electronically submit a non-proprietary summary of that report through the Navy SBIR website. Following the template provided on the site, submit the summary at: **http://www.onr.navy.mil/sbir**, click on "Submission", and then click on "Submit a Phase I or II Summary Report". This summary will be publicly accessible via the Navy's Search Database.

NAVY FAST TRACK DATES AND REQUIREMENTS

The Fast Track application must be received by the Navy 150 days from the Phase I award start date. Phase II Proposal must be submitted within 180 days of the Phase I award start date. Any Fast Track applications or proposals not meeting these dates may be declined. All Fast Track applications and required information must be sent to the Technical Point of Contact for the contract and to the appropriate Navy Activity SBIR Program Manager listed in Table 1 above. The information required by the Navy, is the same as the information required under the DoD Fast Track described in section 4.5 of this solicitation.

PHASE II GUIDELINES

Phase II proposal submission, other than Fast Track, is by invitation only. If you have been invited, follow the instructions in the invitation. <u>**Each of the Navy Activities has different instructions for Phase II submission. Visit the website cited in the invitation to get specific guidance before submitting the Phase II proposal**</u>.

The Navy will invite, evaluate and select Phase II proposals using the evaluation criteria in section 4.3 of the DoD solicitation in descending order of importance with technical merit being most important, followed by the qualifications, and followed by commercialization potential. Due to limited funding, the Navy reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

All awardees, during the second year of the Phase II, must attend a one-day Transition Assistance Program (TAP) meeting. This meeting is typically held in the summer in the Washington, D.C. area. Information can be obtained at http://www.dawnbreaker.com/navytap. Awardees will be contacted separately regarding this program. It is recommended that Phase II cost estimates include travel to Washington, D.C. for this event.

As with the Phase I award, Phase II award winners must electronically submit a Phase II summary through the Navy SBIR website at the end of their Phase II.

A Navy Activity will not issue a Navy SBIR Phase II award to a company when the elapsed time between the completion of the Phase I award and the actual Phase II award date is eight (8) months or greater; unless the process and the award have been formally reviewed and approved by the Navy SBIR Program Office. Also, any SBIR Phase I contract that has been extended by a no cost extension beyond one year will be <u>ineligible</u> for a Navy SBIR Phase II award using SBIR funds.

The Navy typically awards a cost plus fixed fee contract or an Other Transaction Agreement for Phase II.

PHASE II ENHANCEMENT

The Navy has adopted a Phase II Enhancement Plan to encourage transition of Navy SBIR funded technology to the Fleet. Since the Law (PL102-564) permits Phase III awards during Phase II work, the Navy may match on a one-to-four ratio, SBIR funds to funds that the company obtains from an acquisition program, usually up to $250,000. The SBIR enhancement funds may only be provided to the existing Phase II contract. If you have questions, please contact the Navy Activity SBIR Program Manager.

PHASE III

Public Law 106-554 provided for protection of SBIR data rights under SBIR Phase III awards. A Phase III SBIR award is any contract or grant where the technology is the same as, derived from, or evolved from a Phase I or a Phase II SBIR/STTR contract and awarded to the company which was awarded the Phase I/II SBIR. This covers any contract/grant issued as a follow-on Phase III SBIR award or any contract/grant award issued as a result of a competitive process where the awardee was an SBIR firm that developed the technology as a result of a Phase I or Phase II SBIR. The Navy **will** give SBIR Phase III status to any award that falls within the above-mentioned description. The government's prime contractors and/or their subcontractors shall follow the same guidelines as above and ensure that companies operating on behalf of the Navy protect rights of the SBIR company.

ADDITIONAL NOTES

Proposals submitted with the Naval Academy, Naval Post Graduate School, or other military academies as subcontractors will be subject to approval by the Small Business Administration (SBA) after selection and prior to award.

Any contractor proposing research that requires human, animal and recombinant DNA use is advised to view requirements at website http://www.onr.navy.mil/sci_tech/ahd_usage.asp. This website provides guidance and notes approvals that may be required before contract/work may begin.

PHASE I PROPOSAL SUBMISSION CHECKLIST:

All of the following criteria must be met or your proposal will be REJECTED.

____1. Make sure you have added a header with company name, proposal number and topic number to each page of your technical proposal.

____2. Your technical proposal has been uploaded and the DoD Proposal Cover Sheet, the DoD Company Commercialization Report, and the Cost Proposal have been submitted electronically through the DoD submission site by 6:00 a.m. EST 13 October 2006.

____3. After uploading your file and it is saved on the DoD submission site, review it to ensure that it appears correctly.

____4. For NAVAIR topics N06-166 thru N06-170, the base effort does not exceed $80,000 and 6 months and the option does not exceed $70,000 and 6 months. For all other proposals, the Phase I proposed cost for the base effort does not exceed $70,000 and 6 months and for the option $30,000 and 3 months. The costs for the base and option are clearly separate, and identified on the Proposal Cover Sheet, in the cost proposal, and in the work plan section of the proposal.

Navy SBIR 06.3 Topic Index

N06-166 TITLE: GaAsP Photo-cathode process improvement

TECHNOLOGY AREAS: Materials/Processes, Sensors

ACQUISITION PROGRAM: PMA264

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: Develop process for high yield, high quantum efficiency Gallium Arsenide Phosphide photo-cathodes to improve photo-sensor performance and reduce cost.

DESCRIPTION: Several high Priority Navy Blue-Green Electro-Optic (EO) systems utilize a photo-sensing device with a deposited photo-cathode (PC). These PC's are limited to <20% quantum efficiency (QE) and limit short duration (<200 ns) system dynamic range to 3 orders of magnitude. Grown Semi-Transparent Gallium Arsenide Phosphide (GaAsP) PC's have >40% QE and have larger dynamic range. However, the materials processing technique is not well quantified which results in low wafer yields and extremely variable QE's.

PHASE I: Develop proposed GaAsP build and processing technique to produce high yield, wide dynamic range, high QE, semi-transparent GaAsP wafers. Develop a plan for implementing high yield, high QE semi-transparent PC on an existing photo-device.

Exit Criteria:
A developed plan for producing high yield, wide dynamic range, high QE semi-transparent GaAsP wafers.
A developed plan for implementing a high yield, high QE semi-transparent photo-cathode utilizing the new build and processing technique on an existing photo-device.

PHASE II: Implement Phase I plan and study sensitivities inherent in each step of the production process. Implement GaAsP photo-cathode grown with the new technique on current photo-device as a demo unit. Test and evaluate the new photo-cathode demo unit in relevant laboratory tests.

Exit Criteria:
Consistent production of devices that have less then 10% wafer variability on high (>40% at blue/green wavelengths) quantum efficiency of GaAsP wafer runs.

PHASE III: Production photo-devices with high yield, high QE GaAsP photo-cathode available for procurement.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: All photo-sensing devices utilizing a photo-cathode for the visible spectrum would benefit from the availability of a high yield (low cost), high quantum efficiency photo-cathode. Low light cameras and sensors would particularly benefit with improved noise performance in the low light regime.

REFERENCES:
1. V.M. Contarino, D.M. Allocca, B.M. Concannon, T.P. Curren, L.J. Mullen, "Dynamic Range Limitations in Oceanic Lidar Photo-detectors", Proceedings of SPIE 46th Int. Symp. On Optical Science and Technology. 4488-01. July, 2001.

2. B. M. Concannon, V. M. Contarino, D. M. Allocca, L. J. Mullen, "Characterization of signal induced artifacts in photo-multiplier tubes for underwater LIDAR applications", Proceedings of SPIE: Airborne and In-Water Underwater Imaging Vol.3761, P167-174, Oct. 1999.

3. Vincent M. Contarino, Pavlo A. Molchanov, Olga V. Asmolova, "Large-area intensified photodiodes for ocean optics applications ", Proc. SPIE Vol. 5656, p. 156-160, Jan 2005.

4. John P. Edgecumbe, Verle W. Aebi, Gary A. Davis, "GaAsP photocathode with 40% QE at 550 nm ", Proc. SPIE Vol. 1655, p. 204-210, Jun 1992.

5. Tadashi Maruno, Mashahiko Shirai, Motohiro Suyama, Shogo Ema, "Newly improved very high sensitivity electron bombardment CCD sensor and camera", Proc. SPIE Vol. 3965, p. 223-229, May 2000.

KEYWORDS: Quantum Efficeincy, photo-cathode, high yield, GaAsP, Blue-Green, Electro-Optic

TPOC: (301)342-2034
2nd TPOC: (301)342-2021

Questions may also be submitted through DoD SBIR/STTR SITIS website.

N06-167 TITLE: Modeling and Implementations of Non-explosive Electric Sparker Sources

TECHNOLOGY AREAS: Air Platform, Sensors, Battlespace

ACQUISITION PROGRAM: PMA-264, PMA-290, SENSOR FOR ENVIRONMENTAL ASSESSMENT (SEA), ACAT IV

OBJECTIVE: Evaluate and develop processing algorithms and implementation techniques using electric sparker acoustic sources to meet NAVY ASW tactical mission requirements associated with the subsurface battlespace environmental characterization.

DESCRIPTION: Battlespace control of the near-land subsurface shallow water environment is an important future Naval capability. Current air ASW tactics use historical databases to evaluate the shallow water environment for best sensor placement, and hence, best sensor performance. Because of the variability of the littoral environment due to seasons, weather events, and shipping noise, this is an inadequate approach to shallow water environmental characterization. The Navy needs a new approach for shallow water that provides real-time rapid environmental assessment for proper placement of tactical ASW sensors. This system would find use in the Multi-Mission Aircraft (MMA) tactical mission planning, as well as in the collecting, processing and disseminating of meteorological and oceanographic data for NAVY Oceanographic and Atmospheric Master Library (OAML) databases. The Sensor for Environmental (SEA) sonobuoy is a unified sensor buoy being developed to measure environmental parameters such as sound velocity, ambient noise, acoustic transmission loss, and acoustic reverberation real-time in shallow water. Previous approaches for this sensor's mission were based on using explosive acoustic sources. The SEA system is investigating the use of a controllable, safe, i.e. non-explosive, electrical "sparker" acoustic source to replace explosives and meet the need for longer missions with reduced aircraft involvement. Since the source level from sparkers will be less than that of explosives, new processing algorithms and implementation schemes need to be investigated to achieve mission goals. Thus, the development of a SEA system without explosive sources can be enhanced by innovative algorithms and deployment schemes employing electric multiple-ping sparker sources. Research is needed to identify and develop the innovative acoustic processing algorithms and implementation methods to support the successful transition of the SEA buoy to the fleet.

PHASE I: Evaluate processing algorithms and sparker implementation schemes for meeting SEA mission requirements. Select the most promising approaches for development in Phase II. Exit criteria will consist of a list of processing algorithms for evaluation in Phase II with a description of each.

PHASE II: Develop the algorithms and schemes from Phase I and utilize them in sea tests with sparker modules to demonstrate their performance. Design sparker-based SEA buoy systems utilizing the new algorithms and implementations. Exit criteria will consist of a test report showing the evaluation of the various algorithms/data processing techniques and how they fared against each other in sea tests, with a recommended 'best choice' selection based on the data. Also, a design specification for a SEA sonobuoy with sparker source will be generated.

PHASE III: Build and test the Sensor for Environmental Assessment (SEA) system designed in Phase II and conduct Navy sea tests with the new system.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Private-sector commercial potential will be in the areas of ocean environmental monitoring (e.g., oil spills), oil industry uses, and various marine applications. Many of our Allied nations can make use of this technolgy also.

REFERENCES:

1. D. Flynn, "Development of a Sonobuoy Using Sparker Acoustic Sources as an Alternative to Explosives", Oceans '99, MTS/IEEE. Sept, 99.

2. Miyamoto, Robert T. “A Brief Description of Bottom Properties, Measurement Techniques, and Assimilation Needs to Support the Tactical Acoustic Measurement (TAM) System.” Applied Physics Laboratory, University of Washington, 4 May 1999.

KEYWORDS: ASW, Sparker, Algorithm, Acoustics, Source, Sensor

TPOC: (301)342-2058

Questions may also be submitted through DoD SBIR/STTR SITIS website.

N06-168 TITLE: COMPACT HIGH-POWER DC-DC CONVERTER FOR NAVY NON-EXPLOSIVE ACOUSTIC SOURCES

TECHNOLOGY AREAS: Air Platform, Sensors, Battlespace

ACQUISITION PROGRAM: PMA-264, PMA-290, SENSOR FOR ENVIRONMENTAL ASSESSMENT (SEA), ACAT IV

OBJECTIVE: Develop an innovative low-cost, compact, high-efficiency and high-power DC-DC converter for use in electric sparker acoustic sources being developed as potential replacements for existing Navy explosive acoustic sources.

DESCRIPTION: One goal of the NAVY Sensor for Environmental Assessment (SEA) program is to investigate the viability of using a non-explosive based acoustic source in place of existing explosive sources to analyze the undersea warfare environment. Electrical sparker-based acoustic sources are being developed as an alternative for explosives. Sparker modules are expected to have an A-sized or smaller form factor (1/3 A-size) that necessitates minimizing the size of all components. A key element in the internal design of a sparker source is the DC-DC converter that converts the low voltage from battery packs to high voltage DC for the charging of high voltage storage capacitors. The DC-DC converter must be both compact, to achieve the A-size form factor of a sonobuoy, and low-cost, since the buoys are expendable. Current commercial DC-DC converters are designed for long lifetime, have unnecessary control and monitoring circuitry, have low volumetric power densities (<0.4 kW/liter), have non-optimum conversion efficiencies, and are costly. System estimates indicate that innovative DC-DC technologies suitable for this application should be capable of converting 30 VDC battery pack power to 6000 Volts DC power with efficiencies greater than 90%. To meet ping repetition frequency requirements, these converters should be capable of delivering greater than 250W with volumetric power densities greater than 1000 Watts/liter. The targeted lifetime goal for a sparker-sonobuoy is 20 reliable charge cycles with the DC-DC converter package managing thermal loads resulting from a 1 ping per minute firing cycle.

PHASE I: Design and test a breadboard DC-DC converter unit with a power density of a minimum 1 KW/liter demonstrating the potential to achieve the specifications outlined above. Testing should characterize DC-DC performance in charging a capacitive load characteristic of sparkers integrated with the SEA environmental sonobuoy, as well as in a stand-alone sparker system. Based on test results, design and estimate the cost of a DC-DC transformer that meets the requirements outlined above. Exit criteria will include a design specification and cost estimate for the optimized DC to DC converter needed for a 1/3 A-sized sonobuoy package.

PHASE II: Implement the Phase I design, including packaging and testing, and develop a prototype for manufacturing. The prototype design will have a form factor that integrates with other sparker module components to provide the highest source level consistent with the A-size (or smaller) form factor. The design will address high voltage standoff in a compact volume as well as heat management. The resulting prototype will be integrated into a sparker sonobuoy, tested in the laboratory for compliance with performance specifications, and finally, tested at sea. Exit criteria will consist of a protoype converter design built and tested in a prototype sparker source, preferably A-sized or smaller.

PHASE III: Build and Demonstrate several sparker module using the DC-DC converter system in an A-size or smaller NAVY sonobuoy package, preferably, the latest environmental (SEA-equivalent) sensor available. Evaluate its performance in Fleet ASW sea trials.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The DC-DC converter has the potential for use in expendable sparker sonobuoys for the NAVY SEA Program, in the NAVY Multimission Maritime Aircraft (MMA) platform as the MMA environmental sensor, as well as in submarine countermeasures of the future. Many of our Allied nations can make use of this technolgy also. Non-military markets such as those in photomultiplier tube drivers, piezoelectric devices, explosive detonators, air filters, electrophoresis instruments, ion pumps, etc., will benefit from a low cost, high power density DC-DC transformer.

REFERENCES:
1. D. Flynn, "Development of a Sonobuoy Using Sparker Acoustic Sources as an Alternative to Explosives", Oceans '99, MTS/IEEE. Sept, 99.

2. Miyamoto, Robert T. “A Brief Description of Bottom Properties, Measurement Techniques, and Assimilation Needs to Support the Tactical Acoustic Measurement (TAM) System.” Applied Physics Laboratory, University of Washington, 4 May 1999.

KEYWORDS: ASW, Algorithm, Acoustics, Source, Sensor, Sparker

TPOC: (301)342-2058

Questions may also be submitted through DoD SBIR/STTR SITIS website.

N06-169 TITLE: Atmospheric Noise Cancellation for Low Frequency (LF) and Very Low Frequency (VLF)

TECHNOLOGY AREAS: Air Platform, Electronics

ACQUISITION PROGRAM: PMA-271 Airborne Strategic Command, Control & Communications Prog. Ofc.

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: A 3 dB improvement in the signal to noise performance of VLF and LF radios would allow an approximate 1 MW power reduction at each Fixed Submarine Broadcast System (FSBS) transmit site providing an approximate savings of $80/hour. As each transmitter operates 24 hours each day for 312 days per year, the resulting annual cost savings would be $ 599,040.00 per station. There are currently six Navy FSBS transmitters yielding an annual savings of $3.6M. Additionally, airborne operational benefits may be realized. If VLF XMIT range is sufficiently improved, the E-6B may achieve sufficient effective radiative power from a trail (fuel endurance) flight profile vice an orbit flight profile yielding potential fuel savings and reduced airframe fatigue.

Performance objective is to improve routine VLF and LF reception in natural atmospheric noise conditions that will permit greater communications range and to reduce the cost of providing electrical power to the Navy fixed VLF and LF transmitters. This technology would permit doubling current information rates without a loss of signal quality while utilizing the same power requirements for all VLF and LF transmitters, including the E-6B and E-4B National Airborne Operations Center (NAOC) airborne systems.

DESCRIPTION: Very Low Frequency (VLF) and Low Frequency (LF) reception is limited by atmospheric noise caused by lightning. Lightning occurs year round, 24 hours a day at a rate of 200 to 400 times per second and causes VLF and LF interference worldwide. In order to overcome atmospheric noise, very high transmit power is required and corresponding data rates are slowed. The Navy Fixed Submarine Broadcast System (FSBS) transmits VLF with operating power in the megawatt (MW) range. Traditional filtering solutions clip the noise, but also corrupt data during the noise impulse. While Gaussian (white) noise cannot be effectively cancelled, atmospheric noise is not randomly distributed in time or space, thereby lending itself to various cancellation options. Effective atmospheric noise cancellation that preserves signal integrity would allow significant transmitter (XMTR) power reduction and operating cost savings. An additional benefit would be greater VLF/LF communications range and higher data rates.

PHASE I: Phase I would assess feasibility of atmospheric noise cancellation using computer simulation models as necessary to demonstrate atmospheric noise cancellation while preserving signal detection for both Frequency Shift Keying (FSK) and Minimum Shift Keying (MSK) signal modulation.
Phase I Exit Criteria: Demonstrate a bit error rate of 10^-3 with a signal to noise at least 3 dB less than required to achieve a similar bit error rate without the noise reduction algorithm.

PHASE II: Build a prototype system to demonstrate atmospheric noise reduction that can be used with current VLF and LF radios without internal modifications of those radios.
Phase II Exit Criteria: Demonstrate a bit error rate of 10^-3 with a signal to noise at least 3 dB less than required to achieve a similar bit error rate without the noise reduction.

PHASE III: Implement the noise reduction system into operational VLF and LF receive systems.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Process developed could also be applied to radios operating in the commercial AM broadcast band and High Frequency (short wave) bands.

REFERENCES:
1. VLF Radio Engineering; by Arthur D. Watt; Pergamon Press 1967

2. E-6B Avionics System Architecture Document (EASAD); 28 Feb 2004
KEYWORDS: VLF/LF, atmospherics, interference, submarine, broadcasts, RF-signals

TPOC: (301)342-2229

Questions may also be submitted through DoD SBIR/STTR SITIS website.

N06-170 TITLE: Tactical Information Prioritization

TECHNOLOGY AREAS: Information Systems, Battlespace, Space Platforms

ACQUISITION PROGRAM: PMA-299, MH-60R/S Multi-Mission Helicopter

OBJECTIVE: Develop distributed information prioritization algorithms and techniques to enhance situational awareness and survivability by informing tactical aircrew of relevant changes to the maritime picture without overwhelming the available data bandwidth or adding to operator workload.

DESCRIPTION: Future afloat real-time multi-intelligence systems such as the Distributed Common Ground System – Navy (DCGS-N) are bringing together real-time tactical data from a variety of sensor sources into one common database. If transmitted to an aircraft in its entirety, the amount of information available from such a system, even in a small region of interest, could potentially overwhelm the available data networks and the Naval aircrew unless it is appropriately prioritized and “filtered”. The prioritization should be based on the specific tactical objectives, timing and geography of the mission. In addition to ordering the data based on its importance, the amount of detail provided to the aircrew should also be determined so that they are appropriately informed without overloading the available network bandwidth. An “intelligent” prioritization system is needed that can provide each participant with the right information at the right level of detail so that his/her understanding is enhanced without being inundated with data. To avoid additional operator workload, the prioritization process will need to be distributed among the information systems using a machine-to-machine interface that runs in the background and alerts the aircrew only when relevant mission information is available. The analogy would be a Google-like search engine that continually probes the information sources for relevant data and then prioritizes and summarizes the results. Distributed intelligent software agents have theoretically shown promise in making “decisions” to automatically transmit data to participants via a machine-to-machine interface. As an example, a software agent within the DCGS-N system could be “made aware” of an aircraft mission plan along with its objectives and routing. The agent aboard the aircraft would continually monitor the location and state of the aircraft along with its organic sensor data (or perhaps sensor metadata) to determine the type of data needed and its priority. With the appropriate ontology between the two systems, as relevant data is received by the DCGS-N, the distributed software agents on the aircraft and the DCGS-N could interact to determine whether data should be transmitted from the DCGS-N to the aircraft. The decision to pass data should be based on whether the data will enhance aircrew situational awareness, aircraft lethality and/or survivability. The amount of data will be based on the available bandwidth and the time for the aircrew to receive it.

PHASE I: Demonstrate the feasibility of proposed algorithms and techniques to determine information content, priority and quantity criteria.

PHASE II: Develop a prototype information dissemination system and demonstrate the ability to determine information content, priority and quantity criteria between a real-time multi-intelligence database and a Naval airborne mission system.

PHASE III: Work with Navy customers and their primes to identify and mitigate any software transition issues, i.e. real-time performance, etc. Transition technology in a Navy system, e.g., DCGS, MH-60R, F/A-18.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The technology developed under this program will have application to any commercial activity that shares data generated from multiple sources over a large distributed environment.

REFERENCES:
1. Storms, P.P.A.; van Veelen, J.B (Oct. 2001). A process distribution approach for multi sensor data fusion systems based on geographical dataspace partitioning. Target Tracking: Algorithms and Applications (Ref. No. 2001/174), IEE Volume 1, 16-17 Oct. 2001, Page(s):7/1 - 7/9 vol.1 Retrieved from http://ieeexplore.ieee.org/iel5/8017/22147/01031850.pdf?tp=&arnumber=1031850&isnumber=22147>.

2. A.Pawlowski and P. Gerken, "Simulator, Workstation, and Data Fusion Components for Onboard/Offboard Multi-Target Multi-Sensor Fusion", Presented at 17th IEEE/AIAA Digital Avionics Systems Conference, Seattle, WA, November 1998.

3. Ying Z., Jiang, G., Baochun L. (September 2004). "Evolve: toward evolutionary overlay topologies for high-bandwidth data dissemination", Selected Areas in Communications, IEEE Journal on, Volume 22, Issue 7, Sept. 2004 Page(s):1237 - 1251 Retrieved from http://ieeexplore.ieee.org/iel5/49/29362/01327647.pdf?tp=&arnumber=1327647&isnumber=29362.

KEYWORDS: Data Dissemination, Information Prioritization, Information Abstraction, Information Overload, Distributed Intelligent Agents, Data Filtering

TPOC: (301)342-9111
2nd TPOC: (301)342-0506

Questions may also be submitted through DoD SBIR/STTR SITIS website.

N06-171 TITLE: Automated Shipboard Dishwashing System

TECHNOLOGY AREAS: Information Systems, Ground/Sea Vehicles, Materials/Processes, Human Systems

ACQUISITION PROGRAM: CVN-78 ACAT I

OBJECTIVE: Develop an innovative automated shipboard dishwashing system (ASDS), processes and technology that will significantly reduce shipboard manning requirements and overall operating cost.

DESCRIPTION: The proposed SBIR is to develop an integrated and automated system addressing and performing scullery responsibilities such as mess gear scrapping, sorting, soaking, washing/drying and stowage. The Automated Shipboard Dishwashing System (ASDS) will be developed with a modular, open systems architecture approach to permit lifecycle upgrading, flexibility for inclusion of various commercial technologies and systems. The system is envisioned to include computer-controlled sensors and operating mechanisms able to function in all shipboard environments and withstand shipboard motions and sea states. Modeling and simulation are encouraged to guide the development of the ASDS.

The ASDS will be deployed as a workload reducing system for use aboard naval vessels. The system will start with the machine separating the silverware, glassware, dishes, and trays, and end with the racking, and stacking of cleaned and sanitized dishware for pickup. It will automatically perform all labor-intensive dishwashing functions allowing the food service operators to optimize personnel resources elsewhere, save time and effort. The ASDS will have the additional ability to employ the automated dishwashing system within a confined space (shipboard) area.

The General Accounting Office June 2003 report on Military Personnel, “Navy Actions Needed to Optimize Ship Crew Size and Reduce Total Ownership Costs states, "on DD (X) the Navy could save $600 million per ship over a 35 – year service life in personnel – related costs.” The adaptation of Human Systems Integration principles and the use of people only where it is cost effective will reduce the total lifecycle ownership cost of Naval vessels.” The Automated Shipboard Dishwashing System will contribute significantly to that total lifecycle cost reduction.

PHASE I: Develop approaches for a automated shipboard dishwashing system concept for Navy surface ships to eliminate Scullery and Pot & Pan room manning requirements and reduce the number of personnel performing scullery and pan washing functions. Identify ensuing manning reductions, lifecycle costs, quality of life impacts and performance in naval shipboard environments. Identify required equipment, incorporate smart galley processes, and concept of operations, architectures, and interfaces including Human System Integration Principles.

PHASE II: Prototype the automated dishwashing system concept as determined in Phase I. Demonstrate (land-based) the operation of the systems and related equipment. Define maintenance procedures, system diagnostics and prognostics and project lifecycle costs for all Navy shipboard operational mission requirements and situations. Characterize interface restrictions and circumstances for the new system and address both legacy and futuristic naval vessel Implementations. Evaluate performance in the Navy unique environment including shock, vibration, and equipment tilt requirements as specified in the ABS Naval Vessels Requirements for Food Service Facility Design Practices.

PHASE III: Demonstrate the automated shipboard dishwashing system configuration aboard a U.S. Navy ship operated by Navy personnel. Document manpower reduction, lifecycle cost projections, maintenance requirements, impacts and interfaces with other ship systems and existing and planned logistical support communities, and performance in the Navy unique environment. Develop a plan to integrate automated dishwashing system concept on new construction U.S. Navy platforms.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Cruise ships that currently utilize technologically advanced smart appliances, cargo ships, tankers, and workboats in the commercial sector could benefit from the integration of the automated shipboard dishwashing system technologies and approaches, as could Military Sea Lift Command and U.S. Coast Guard ships. US Navy shore-side and other governmental, institutional, and commercial installations could benefit from the automation and other technologies used to reduce manpower and streamline system operation and efficiency. The additional ability to employ an automated dishwashing system within a confined space (shipboard) area will appeal to the commercial sector as a cost effective space optimization measure.

REFERENCES:

1. "General Accounting Office June 2003 Report, Military Personnel, Navy Actions Needed to Optimize Ship Crew Size and Reduce Total Ownership Costs".

2. MIL-STD-167, Mechanical Vibrations of Shipboard Equipment.

3. MIL-STD-461-E, Electromagnetic Interference (EMI).

4. "NAVSUP Advanced Food Study aboard USS McFaul", Naval Supply Systems Command, Mechanicsburg, PA, September 1999.

KEYWORDS: automation, scullery processes, smart controll processes, fault tolerences, adaptive computing, remote servicing

TPOC: Louis Jamieson
Phone: (508)233-4103
Fax:
Email: louis.jamieson@natick.army.mil

N06-172 TITLE: Affordable Alternative Power Supply for Uninterruptible Power Supply (UPS) Systems

TECHNOLOGY AREAS: Ground/Sea Vehicles, Materials/Processes

ACQUISITION PROGRAM: PEO Ships, PMS 400D, Aegis New Construction Program, ACAT 1D

OBJECTIVE: Develop an alternative power supply for an Uninterruptible Power Supply (UPS) system that is capable of extended operational durability and reduced lifecycle maintenance compared to lead acid batteries.

DESCRIPTION: The current lead acid battery power supply for the US Navy UPS can only provide maximum power requirements for 15 minutes, and a reduced power supply for up to 45 additional minutes. An alternative power supply of the same footprint that has the capability to supply power for up to 24 hours is needed for shipboard operations. The technology targeted must have higher power densities, increased endurance time, and operate without the need for an additional fuel system. The innovative technical challenges that would impact the design of a useful alternative power supply for shipboard UPS applications are; the ability to resist degradation due to repeated cycling of the system on and off, the ability to continue operation with the ingestion of salt air andother ambient air contaminates, the ability to instantaneously supply power within specified time constraints, and the ability to be easily regenerated onsite. The goal of this effort is the production of comparatively priced, high performancesystem in the 5-50 kWe range for use in a US Navy UPS system that meets or exceeds all of the form, fit, and functional requirements of the current lead acid battery powered UPS. The proposed system should be capable of >40WHr/Liter, 24volt and 48volt DC output.

PHASE I: Conduct a design analysis of various candidate power systems. Evaluate energy density, power density, size weight, start up times, anticipated maintenance requirements, ability to withstand a shipboard environment. Develop a design concept and specification for the selected power source.

PHASE II: Finalize the design concept from Phase I and fabricate a prototype of the alternative powered UPS system. Validate prototype capabilities using laboratory testing and provide results. Demonstrate proposed installation, maintenance, repair, and regeneration methodologies. Develop a cost benefit analysis and perform testing and validation.

PHASE III: Install and test on a DDG-51 Class destroyer. Provide detail drawings and specifications. Technology will have potential to transition to all US Navy platforms that require an UPS system.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The system will be applied to a wide variety of government and commercial UPS system marine applications.

REFERENCES:
1. http://assist.daps.dla.mil/quicksearch/, MIL-P-24765, Power Supply, Uninterruptible, Static

2. http://assist.daps.dla.mil/quicksearch/, DOD-STD-2003-2, Electric Plant Installation Standard Methods for Surface Ships and Submarines

3. http://assist.daps.dla.mil/quicksearch/, MIL-STD-1399 Section 300, Interface Standard for Shipboard Systems

4. http://assist.daps.dla.mil/quicksearch/, MIL-S-901, Shock Tests. H.I.(High-Impact) Shipboard Machinery, and Systems, Requirements

5. http://assist.daps.dla.mil/quicksearch/, MIL-STD-167, Mechanical Vibrations of Shipboard Equipment

KEYWORDS: Black-out, Harmonics, Power, Back-up power, Battery, Uninterruptible Power Supply, UPS

TPOC: Brian Prew
Phone: (215)897-8633
Fax:
Email: brian.prew@navy.mil
2nd TPOC: John Kuseian
Phone: (215)897-8330
Fax:
Email: john.kuseian@navy.mil

N06-173 TITLE: Technologies to Improve Mid-tiered Shipbuilding Design and Planning Functions

TECHNOLOGY AREAS: Information Systems, Ground/Sea Vehicles, Materials/Processes

ACQUISITION PROGRAM: LCS, PMS 501, ACAT ID

OBJECTIVE: To develop and implement innovative technologies to improve the efficiencies in the design and planning aspects of second and third-tiered commercial shipbuilding and repair. The tools shall develop and/or tap into currently inaccessible or unavailable information, databases and rules to assist in decision making for shipyard planner and design personnel.

DESCRIPTION: The Navy's Program Executive Office for Ships is leveraging the National Research Program (NSRP) to effect change across the non-nuclear surface shipbuilding, modernization and repair enterprise by coordinating with U. S. shipbuilders to adapt and implement "World Class" commercial best manufacturing practices. The topic seeks to improve design and planning practices for Naval ship construction and repair as well as to improve the position of the domestic shipbuilder in the global market.
This topic seeks innovative scientific and engineering solutions to inefficiencies in long-standing design, engineering and planning methods. This topic offers an opportunity to infuse new ideas/innovations into the smaller, domestic shipbuilding industry. Of particular interest are initiatives with a clear business case. Proposals should specifically describe the technology that will be applied to solve the problem, how it will be developed, what the estimated benefits will be and how it might be transitioned into the shipbuilding industry.
Proposals under this topic must address integration of the research areas identified. Efforts cited within each research area are illustrative only and proposals dealing with related efforts within each research area are also solicited.

1. Rule-based Design and Engineering Support – Practical, easily-integrated tools that support design and planning decisions by providing issue-specific current technical data, information and historical data. Research areas include, but are not limited to:
a. Weld-planning,
b. Material availability and potential substitution alternatives
c. Life-cycle data such as repair-history, environmental corrosion data/limitations, etc.

2. Simulation-based planning and dynamic rescheduling - facility-adaptable tools that can change the approach to planning, monitoring and dynamically altering, in real-time, complicated manufacturing schedule of near-term events due to changes to specific equipment or facility availabilities. Open-system architecture solution are preferred.

Of particular interest are initiatives with a clear business case. Proposal should specifically describe the technology that will be applied to solve the problem, how it will be developed, what the specific benefit will be and how it might be transitioned into the shipbuilding industry. NSRP members are available to provide guidance and assistance in the identification of common issues and needs. Contact with these resources is encouraged both prior to proposal development and during any subsequent SBIR-related activity. Teaming with a NSRP member (or Government shipyard) is voluntary and will not be a factor in proposal selection.

PHASE I: Demonstrate feasibility for improvements being developed and also identify impact upon shipbuilding affordability. Include a first order Return-On-Investment (ROI) analysis for industry implementation and estimate potential Total Ownership Cost (TOC) reduction. Establish Phase II performance goals and key developmental milestones.

PHASE II: Finalize the design, as appropriate, and demonstrate a working prototype of the proposed system. Perform laboratory tests to validate the performance characteristics established in Phase I. Develop a detailed plan and method of implementation into a full-scale application.

PHASE III: Implement the Phase III plan developed in Phase II in coordination with the shipbuilding and repair industry.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The technology developed under this topic shall be directly applicable to current military and commercial shipbuilding operation and repair practices. The products developed should find wide use in most heavy industrial plant/processing facilities such as the power industry and will be marketable to the shipbuilding and repair industry.

REFERENCES:
1. NSRP ASE Strategic Investment Plan, available on line at http://www.nsrp.org.

2. Shipbuilding Technology and Education, National Academies Press, Washington DC, 1996.

3. US Naval Shipyard information is available at http://www.shipyards.navy.mil.

4. Past SBIR project database can be found at http://www.zyn.com.

KEYWORDS: simulation, planning, rule-base design, dynamic scheduling

TPOC:	William Palko
Phone:	(202)781-1732
Fax:	(202)781-4570
Email:	william.palko@navy.mil
2nd TPOC:	Jim Mays
Phone:	(301)227-1938
Fax:	(301)227-5753
Email:	James.Mays@navy.mil

N06-174 TITLE: Investigate and Develop an Analytical Approach to Automatically Mitigate Electrical Faults Caused by Battle Damage

TECHNOLOGY AREAS: Information Systems, Ground/Sea Vehicles, Electronics

ACQUISITION PROGRAM: Captian Syring, PMS 500, DD(X), ACAT I

OBJECTIVE: Explore the development and application of an analytical approach to automatically mitigate the effects of damaged induced electrical faults for medium voltage (4.16-13.8kV) distribution systems.

DESCRIPTION: Electrical faults in the shipboard power system can result in the loss of power to critical loads of the system. Currently, there are two approaches in predicting electrical faults so that corrective action can be taken. The first approach mitigates the propagation of the fault within an electrical zone using power electronics. The second approach involves using multiple sensing devices to measure and attempt to predict the electrical fault on the system. While both of these approaches are successful in mitigating the fault effects, neither addresses the magnitude of the fault current itself.

To support future combatant ships requirements, this topic seeks new and innovative approaches to automatically mitigate the magnitude of the fault current on the power system. With the ability to limit the fault current amplitude, the system components will no longer need to be oversized for large fault currents. This will prove cost-effective, providing less stringent design parameters for the components on the distribution system. Further, it is envisioned that this new development will dramatically reduce the interrupt requirements of system breakers, leading to a faster system response to faults. An ideal solution would be a system that quickly detects faults, while incorporating into the system the appropriate amount of inductance to limit the fault current amplitude. The power requirements of the system are approximately 70MW of generated power with a medium voltage distribution system of 4.16-13.8kV.

PHASE I: Demonstrate the feasibility of an innovative approach to automatically mitigating the effects of electrical faults as a result of battle damage. Identify and define the required architecture to successfully operate the proposed approach. Develop an initial conceptual design and establish performance goals and metrics to analyze the feasibility of the proposed solution. Develop a test and evaluation plan that contains discrete milestones for product development for verifying performance and suitability.

PHASE II: Develop and demonstrate the prototype(s) as identified in Phase I. Through laboratory testing, demonstrate and validate the performance goals as established in Phase I. Refine and demonstrate the capabilities of the system. Develop a cost benefit analysis and a Phase III testing and validation plan.

PHASE III: The small business will work with the Navy and commercial industry, as applicable, to transition a full-scale system that is capable of operating in the 13.8kV - 4160V range.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Having a tool with the ability of limiting the effects of faults is a powerful capability that can transition in many markets, such as the terrestrial power system industry and large industrial power customers.

REFERENCES:
1. Jayabalan, R., Fahimi, B., "Fault Diagnostics in Naval Shipboard Power System for Contingency Management and Survivability", Proceedings of 2005 IEEE Electric Ship Technologies Symposium, pp 108-111.

2. K. L. Butler-Perry, N. D. R. Sarma, I. V. Hicks, "Service Restoration in Naval Shipboard Power Systems", IEE Proceedings on Generation, Transmission and Distribution, Vol. 151, Issue 1, pp95-102.

KEYWORDS: Electric Faults, Reconfiguration, Restoration, DDX, Electrical, Medium Voltage,

TPOC: Chris Dafis
Phone: (215)897-7956
Fax:

Email: chris.dafis@navy.mil
2nd TPOC: Joseph Tannenbaum
Phone: (202)781-2629
Fax:
Email: joseph.tannenbaum@navy.mil

N06-175 TITLE: High Energy Material Containment

TECHNOLOGY AREAS: Ground/Sea Vehicles, Materials/Processes

ACQUISITION PROGRAM: PEO SHIPS – Littoral Combat Ship (PMS501) - ACAT ID

OBJECTIVE: Develop innovative material solutions that provide enhanced safety for the storage and transport of highly energetic materials.

DESCRIPTION: The Navy and all military services utilize a range of highly energetic materials ranging from flares, bolt cutters, rocket motors, and specialized batteries with exotic metals, up to explosive warheads. The storage and handling of these materials requires extensive mitigation resulting in severe weight, performance, and cost penalties while still exposing the host to increased risk of catastrophic damage. The focus of this topic is to develop materials and systems optimized for the containment of highly energetic materials in storage and transport aboard Navy ships. The objective is the development of materials to facilitate a containment system providing complete isolation of the energetic material such that it can be stored and handled equivalent to an inert load with minimal risk of activation and minimal risk of release of energy outside of the containment boundary.

PHASE I: Demonstrate the feasibility of a detailed concept that supports the topic's objectives. Assess relative performance metrics, to include cost and weight, for each proposed technology to support selection of an optimal solution for energetic material storage and transport with appropriate risk factors to include thermal, ballistic, shock, and radio-frequency activation, and thermal, shock and fragmentation release. Provide detailed material concept recommended for further development based on results.

PHASE II: Develop detailed material system plans for the intended applications. Conduct material technology and system development, including production and handling processes. Produce prototype material system and characterize performance and risks in simulated energetic material storage and transport conditions, to include factors listed above.

PHASE III: Working with the Navy, integrate SBIR products into shipboard and independent systems. Develop transition plans and support demonstration of final system performance in high energy material containment.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Private industry utilizes similar highly energetic materials including safety at sea flares, tow-line bolt cutters, and even explosive charges for mining and drilling. In each of these cases heavy and expensive specialized containers are required. Material technology from this SBIR that can offset those impacts will be highly marketable.

REFERENCES:
1. "Interface Control Document (ICD) for Littoral Combat Ship (LCS) Flight Zero Reconfigurable Mission Systems," Baseline 1.0, 18 February 2005. Available at http://www.navysbir.com/ via the SBIR/STTR Interactive Topic Information System (SITIS) web link

2. [2004] 49CFR173-- PART 173_SHIPPERS_GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

3. NAVSEAINST 8020.08D - Shipping requirements

4. MIL-STD-464 - Electromagnetic Environmental Effects Requirements For Systems
http://assist.daps.dla.mil/quicksearch/

KEYWORDS: Containment, energetic materials, explosives, storage, advanced materials

TPOC: Michael Bonanno
Phone: 301-744-1440
Fax: 301-744-6223
Email: michael.bonanno@navy.mil
2nd TPOC: Thomas Owen
Phone: (540)653-7614
Fax: (540)653-7193
Email: thomas.f.owen1@navy.mil

N06-176 TITLE: Advanced Bridge Windows for Surface Ships

TECHNOLOGY AREAS: Ground/Sea Vehicles, Materials/Processes

ACQUISITION PROGRAM: PEO Ships, PMS 400D, Aegis New Construction Program, ACAT 1

OBJECTIVE: Explore the development and the application of advanced materials and/or technologies to provide an improved, affordable, self-cleaning, ice-resistant alternative bridge window system for surface ships.

DESCRIPTION: The current bridge window and wiper system does not provide a clear view during adverse weather conditions. The wiper system has a well documented history of malfunctioning, resulting in high maintenance costs. Wind, ice, and heavy rain conditions are inevitable during sea operations. The current configuration provides only one (in some cases two) small spinning window(s) with very limited visibility during adverse weather conditions. This configuration has been known to actually obscure visibility during clear weather as well.

This topic seeks to explore the development and application of improved materials and/or technology solutions for an advanced window system concept that will feature improvements such as; self-cleaning, anti-fogging, non-icing, scratch resistant, glare dampening, and will provide a Radar Cross Section (RCS). The advanced window system proposed shall meet or exceed all of the required ship specifications of the current bridge window system including; optical qualities, Electromagnetic Interference (EMI), shock, vibration, and applied static pressures. Solutions proposed shall be Radar Cross Section (RCS) compliant, shall allow for the use of night vision goggles and shall integrate with existing ship service support systems. The system proposed shall fit into the existing footprint of the current DDG bridge window system.

PHASE I: Demonstrate the feasibility of an advanced bridge window system. The study shall identify suitable candidate materials, equipment(s), and manufacturing processes and methods of installation anticipated to enable the developed and integration of the proposed system. Establish performance goals and metrics to analyze the feasibility of the proposed solution. Develop a test and evaluation plan that contains discrete milestones for product development for verifying performance and suitability.

PHASE II: Develop, demonstrate and fabricate a prototype as identified in Phase I. In a laboratory environment, demonstrate that the prototype meets the performance goals established in Phase I. Verify final prototype installation methodologies in a representative laboratory environment and provide results. Develop a cost benefit analysis and a Phase III testing and validation plan.

PHASE III: Construct a full-scale prototype based on the Phase II results for testing in a shipboard environment. Working with government and industry, install onboard a selected DDG 51 class hull and conduct extended shipboard testing.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Potential commercial applications include all classes of U.S. Naval and Commercial ships and aircraft, cars, trucks, buses, and construction equipment. Any window required to provide protection and visibility to people during adverse weather conditions.

REFERENCES:
1. http://assist.daps.dla.mil/quicksearch/, MIL-STD-461, Requirements For The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

2. http://assist.daps.dla.mil/quicksearch/, MIL-G-2857B Glass, Heat Treated, Glazed, Rectangular for Bridge Windows

3. http://assist.daps.dla.mil/quicksearch/, MIL-G-3787, Class 1, Type 1 Glass, Laminated, Flat; (except aircraft) (s/s by ANSI-Z26.1)

4. http://assist.daps.dla.mil/quicksearch/, MIL-W-18445 Windows, Non-Icing, Laminated Flat Glass, Electronically Heated, with Controls

5. http://assist.daps.dla.mil/quicksearch/, ASTM C 1048 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass

6. http://assist.daps.dla.mil/quicksearch/, ASTM C 1036 Glass, Flat

KEYWORDS: Window, Anti-fogging, Non-icing, Scratch-resistant, Bridge, Bridge Operations,

TPOC:	Stephen Grasso
Phone:	(215)897-8475
Fax:	(215)897-1094
Email:	stephen.grasso@navy.mil
2nd TPOC:	David Simunov
Phone:	(215)897-1470
Fax:	(215)897-1094
Email:	david.simunov@navy.mil

N06-177 TITLE: Development of a Power System Management Tool to Support Automated Damage Control for Shipboard Power Systems

TECHNOLOGY AREAS: Ground/Sea Vehicles, Electronics

ACQUISITION PROGRAM: Captain Syring, PMS 500, DD(X), ACAT I

OBJECTIVE: Develop a methodology and associated algorithms to enable automated damage control and power system management for reconfigurable shipboard power systems.

DESCRIPTION: Due to the inherent nature of an all electric ship vision, the impacts of reduced manning, the embedded automation in future power systems will be complex, tightly coupled, and will be incorporating advanced control system principles. As such, there is a need for a single comprehensive tool capable of satisfying the requirements of automated management and control for shipboard power systems. While models exist that are either continuous or discrete, a methodology for incorporating both states does not exist.

This topic seeks innovative approaches toward the development of an automated power system management tool for shipboard use to support damage control and power systems management operations. The tools should be capable of representing the dynamic performance (differential equation description), the steady-state performance (algebraic description) and the system reconfiguration routines (discrete events) in one comprehensive tool. This challenge is complicated given that multiple faults can occur in rapid succession, resulting in a system that increasingly becomes nonlinear, operates within decreasing stability margins and is therefore more vulnerable to additional faults or inappropriate corrective actions.

PHASE I: Demonstrate the feasibility of a power system management tool for shipboard use. Identify and define the required architecture to successfully operate the proposed approach. Develop an initial conceptual design and establish performance goals and metrics to analyze the feasibility of the proposed solution. Develop a test and evaluation plan that contains discrete milestones for product development for verifying performance and suitability.

PHASE II: Develop and demonstrate the prototype(s) as identified in Phase I. Through laboratory testing, demonstrate and validate the performance goals as established in Phase I. Refine and demonstrate the capabilities of the system. Develop a cost benefit analysis and a Phase III testing and validation plan.

PHASE III: The small business will work with the Navy and commercial industry to transition a full-scale system that is modular to accommodate various shipboard power system architectures.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Having a tool capable of describing the dynamics of the system during reconfiguration is a powerful capability that can transition in many markets, such as the terrestrial power system industry, and the automotive industry for the development of modern vehicles. The recent Northeastern Blackout of August 2003 demonstrated the inability to appropriately react to dynamics and faults in various regions of the national power grid.

REFERENCES:
1. X. D. Koutsoukos, et al, "Supervisory Control of Hybrid Systems," IEEE Proceedings, Vol. 8, No. 7, 2000, pp. 1026-1049.

2. Kwatny, H.G.; Mensah, E.; Niebur, D.; Teolis, C., "Optimal Shipboard Power System Management Via Mixed Integer Dynamic Programming," Electric Ship Technologies Symposium, 2005 IEEE, 25-27 July 2005 Page(s):55 - 62.

KEYWORDS: Power System Management, Reconfiguration, Modeling and Simulation, Hybrid Systems

TPOC: Chris Dafis
Phone: (215)897-7956
Fax:
Email: chris.dafis@navy.mil
2nd TPOC: Joseph Tannenbaum
Phone: (202)781-2629
Fax:
Email: joseph.tannenbaum@navy.mil

N06-178 TITLE: Stability Improvements of Radar Transmitters

TECHNOLOGY AREAS: Sensors, Electronics

ACQUISITION PROGRAM: PEO IWS 2.0 - Above Water Sensors

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: Develop new concepts and techniques for improving the stability of existing Navy radars by using adaptive cancellation of transmitter noise through advanced signal processing of the received signal.

DESCRIPTION: The 21st Century Navy is required to operate near-shore in high clutter environments. Often the stability of the transmitter is the limiting factor in achieving suppression of clutter returns. It is well known that a sample of the transmitted radar pulse can be used to correct for transmitter errors in the radar signal processor and thus improve clutter suppression [1]. First known as "Locked-COHO" or "Coherent-on-receive" [2,3] this approach was initially implemented as a simple phase locking of the received radar returns but the addition of an amplitude correction is straightforward.

In this SBIR topic it is desired to generalize the classical "coherent-on-receive" approach, from making a single complex correction to the received clutter returns, to making multiple such corrections across the duration of the radar pulse-width based upon a direct measurement of each transmitted pulse. Since once the transmit signal is radiated it is deterministic, the sample of each pulse can be used to equalize received signals within a "coherent dwell interval" to provide a significant clutter improvement factor. The target of this development is radars using transmitters with crossed-filed amplifier (CFA) output tubes, which have relatively high intra-pulse noise levels. Challenges with this technique are obtaining a high quality sample of the transmitted signal, implementing efficient signal processing algorithms which equalize the coherent dwell, and processing returns containing clutter from multiple range intervals.

PHASE I: Develop and conduct proof-of-concept demonstrations using simulated and/or real radar data. Define a concept and algorithm for a transmitter noise cancellation system and perform simulations to predict performance.

PHASE II: Refine the concepts developed in Phase I and demonstrate the effectiveness of the algorithms in near real-time on a Naval radar (e.g. SPY-1B/D, SPS-48).

PHASE III: Implement the transmitter noise cancellation approach developed during Phases I and II as part of a future upgrade to a major radar. Pursue commercialization of the developed approach to low cost weather and cloud radars.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The techniques developed during Phase I and II can be used to improve the stability of low-cost weather or cloud radars. More broadly, noise cancellation techniques can be applied to numerous consumer products.

REFERENCES:
1. J.L. Lawson and G.E. Uhlenbeck, Threshold Signals, MIT Radiation Lab. Series, Vol. 24, 1949.

2. H. Li et al,"A simple method of Dopplerizing a pulsed Magnetron radar", Microwave Journal, pp. 226-236, April 1994.

3. R. Croci, "Coherent-on-receive systems", 28 December 2003 (http://www.alphalpha.org/radar/dlfiles/coho_e.pdf).

4. R.L. Trapp, "Improved coherent-on-receive radar processing with dynamic transversal filters," Radar-82; Proceedings of the International Radar Conference, Inst of Electrical Engineers (A84-10751), pp. 505-508, 20 October 1982.

KEYWORDS: Radar stability, MTI radar, Transmitter noise, Noise cancellation, Adaptive cancellation, Pulse Doppler

TPOC: Vilhelm Gregers-Hansen
Phone: (202)404-1925
Fax: (202)404-2561
Email: vgh@radar.nrl.navy.mil
2nd TPOC: Mai Ngo
Phone: (202)767-0253
Fax: (202)404-2561
Email: ngo@radar.nrl.navy.mil

N06-179 TITLE: <u>Real-Time, Secure, and Fault Tolerant Discovery for Publish-Subscribe Middleware in a WAN Environment</u>

TECHNOLOGY AREAS: Information Systems, Ground/Sea Vehicles, Battlespace

ACQUISITION PROGRAM: PEO IWS 7.0 Open Architecture

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: Develop protocols, services, and methodologies for performing real-time, fault tolerant discovery of publish-subscribe entities over WAN environments that will meet the Information Assurance (IA) needs of the Global Information Grid (GIG).

DESCRIPTION: Navy, DoD, and commercial real-time systems are increasingly adopting publish-subscribe middleware technology. Typically, these systems are limited to a local area network (LAN) environment such as a single combat system or as a single air, surface, or subsurface platform. As the Navy begins to leverage FORCEnet and the GIG, this technology has the potential to play a significant role in distributed operations such as engage-on-remote, while helping to limit bandwidth consumption through a "smart-push" mechanism for sending data only to the systems that have a need for that data.

However, current real-time publish-subscribe technology does not support usage in a Wide Area Network (WAN) environment. In particular, the protocols used to dynamically locate data consumers and data providers generally require significant communication between participants so that the discovery information is fully fault tolerant. In a WAN, this may result in excessive bandwidth consumption as well as the introduction of significant delays in the initiation of data transmission to those who require it. New technology for discovery protocols, services and methodologies are required to resolve this problem. Additionally, any communication over the GIG must be protected. The information assurance mechanisms provided by the GIG backbone are in development and evolving. These mechanisms will likely be implemented at the network and transport layers. Because publish-subscribe middleware is generally used in a self-contained environment, mechanisms to validate the identity of data producers and consumers as well as the ability to associate classification data with the data transmitted have not been addressed by existing technologies and products.

PHASE I: Assess the technical feasibility of implementing a fault-tolerant, real-time publish-subscribe discovery capability for WANs. If the assessment is favorable, then produce a plan to accomplish the work. Such a plan should (1) document the development phases, the achievements and corresponding tasks for each phase and (2) estimate the allocation of resources to given tasks. Produce a schedule which shows how the work undertaken will be realistically completed within the temporal and monetary constraints imposed by the contract.

Also, supply a plan for demonstrating that the product fulfills the goals of Information Assurance with fault tolerance and real-time performance.

PHASE II: Use the innovative artifacts of Phase I to develop a fault-tolerant real-time, publish-subscribe discovery capability in a WAN environment. Demonstrate that the product can be used to meet Information Assurance requirements.

PHASE III: Work with publish-subscribe middleware vendors and other relevant members of the middleware community to use the fault tolerant, real-time, and secure publish-subscribe discovery capability as part of a publish-subscribe middleware implementation that features fault-tolerant, real-time, and secure properties.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The need for real-time fault-tolerant and secure middleware over a WAN goes far beyond Defense warfare systems; such a technology would be of great value in any distributed application where reliability, information assurance, and time-deterministic performance are critical. Other domains of interest include homeland defense, transportation, finance, and telecommunications.

REFERENCES:

1. M. Swick, J. White, M. Masters. "A Summary of Communication Middleware Requirements for Advanced Shipboard Computing Systems", Fifth IEEE Real-Time Technology and Applications Symposium, pages 245-254, 1999.

2. OMG Data Distribution Service for Real-time Systems, v1.1, Dec 2005.

KEYWORDS: Real-time, Fault Tolerance, Secure, Publish-Subscribe Middleware, Middleware, Data Distribution Service (DDS)

TPOC: Ralph Childress
Phone: (540)653-8140
Fax: (540)653-4270
Email: ralph.childress@navy.mil

N06-180 TITLE: Advanced EA and EMI Radar Processing

TECHNOLOGY AREAS: Sensors, Electronics

ACQUISITION PROGRAM: PEO IWS 1.0, Integrated Combat Systems Division

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: Develop techniques that can determine whether radar returns are from direct or bi-static reception of other similar radars, or from advanced deceptive jammers.

DESCRIPTION: With the proliferation of high power radars the electromagnetic environment is getting very complex and it is getting increasingly difficult to determine if a detection is a normal radar reflection, if the system is actively being jammed or if it is receiving signals from nearby similar systems. With advances in radar processing, such as Specific Emitter Identification, it may be possible to determine the origin of the signal being received or even to identify if the return is a natural reflection or the output of a deceptive jammer. If it could be determined that the interfering signal is not a true jammer, the radar system would not have to expend valuable radar time with sophisticated Electronic Protection techniques. The goal is to incorporate parallel processing that can identify and sort real detections from false jammer detections while also identifying potential sources of interference – such as similar, friendly emitters. No new data is required – the existing signal would be processed through additional algorithms and the signal source information captured. This improvement will allow concentration of limited resources on real threats and countering intentional deceptions instead of wasting them on unintended interference.

PHASE I: Investigate the feasibility of performing this type of signal identification and determine the required algorithms and signal processor characteristics.

PHASE II: Develop a prototype model that demonstrates the ability to discriminate between valid targets, jamming, and interference. Develop a test plan to collect real radar returns from targets, clutter, denial and deception jammers, and interference from a nearby similar radar. The contractor will then demonstrate the ability to properly sort the returns into valid targets, jammer targets, and interference.

PHASE III: Transition technology (algorithms and signal processor) to discriminate self generated radar returns from jamming/similar radar systems signal to fleet systems. Demonstrate system effectiveness aboard ship during sea trials.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Technologies developed are applicable to commercial air traffic control, weather, and marine navigation radar systems.

REFERENCES:
1. J. Ackenhusen, "Real-Time Signal Processing", Prentice Hall, Englewood Cliffs, NJ, 1999

2. S. Smith, “The Scientist and Engineer's Guide to Digital Signal Processing 2nd Ed.”, California Technical Publishing, San Diego, California, 1999

3. M. Skolnik, “Radar Handbook (2nd Ed.)”, McGraw-Hill, New York, NY, 1990

KEYWORDS: Radar processing, Electro-Magnetic Interference, Specific Emitter Identification, Jamming, Electronic Protection, EA (Electronic Attack)

TPOC: Terry Foreman
Phone: (540)653-8005
Fax:
Email: terry.foreman@navy.mil

N06-181 TITLE: Miniaturized Safe-Fuel Electrically-Controlled Divert & Attitude Control System

TECHNOLOGY AREAS: Ground/Sea Vehicles, Materials/Processes, Weapons

ACQUISITION PROGRAM: PEO IWS, Naval Surface Fire Support Program (IWS 3C).

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OBJECTIVE: Develop low-cost, IM compliant, electrically controlled, extuinguishible, solid fuel, divert & attitude control system for high-performance hypersonic airframes.

DESCRIPTION: The Office of Naval Research (ONR) has embarked on an Innovative Naval Prototype of an Electromagnetic Gun System that accelerates projectiles to hypersonic speeds enabling ranges beyond 245 nmi in less than six minutes time of flight. The projectile must function over the entire range of aerodynamic pressures during endo-atmospheric and exo-atmospheric portions of hypersonic flight; thus a control system that can provide effective attitude and divert control over a wide range of thrust levels to enable system accuracy is required. During exo-transit phase of the trajectory, the control system must be able to course correct for trajectory errors imputed during launch and endo-ascent. During reentry the control system must be able to maintain a small angle of attack to maintain stable flight. During descent, the control system must have sufficient divert capability to achieve accuracies on the order of 5-m CEP. Thrust levels commensurate with both endo- and exo-atmospheric dynamic pressures must be achievable and these varying thrust levels must be initiated and extinguished repeatedly over the trajectory in order to preserve fuel and meet the stringent 10 in3, or smaller, packaging constraints. Furthermore, Insensitive Munitions (IM) compliance issues must be addressed via safe solid fuel technologies. Munitions containing energetics are required by section 2389 of title 10, United States Code, to ensure lifecycle safety when subjected to unplanned stimuli. The Mil-Std 2105C hazard assessment tests have revealed that many munitions under development are not insensitive.

PHASE I: Evaluate the feasibility and requirements, via concept studies. The contractor shall identify applicable system operational and environmental requirements, propose solid safe-fuel formulations, perform 6-dof endo-, exo-, endo-flight dynamics study, and develop packaging concepts.

PHASE II: Verify predictions with lab testing to demonstrate electrical-control of thrust levels, thrust durations, and repeated initiations of the candidate safe-fuel formulations. Down select best solid fuel formulation. Perform initial design of MS EDACS. Fabricate, Integrate, and Test MS EDACS in hardware-in-the loop performance simulations. Launch shock EDACS to determine failure modes. Develop thermal performance simulations.

PHASE III: In FY04, the Office of Naval Research embarked on an Innovative Naval Prototype for an Electromagnetic Gun System. Concept hypersonic flight demonstrations will occur in which a series of saboted airframes will be both chemically and electromagnetically launched. The contractor will perform detail design of a gun-hardened MS EDACS to survive 50 kG launch acceleration. Fabricate, Integrate & test gun-hardened MS EDACS into airframe to verify hypersonic aero-thermal performance and ultimately demonstrate a hypersonic divert manuever. Successful demonstrations will facilitate transition into the follow-on System Development & Demonstration Acquisition Program sponsored by NAVSEA IWS3C.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Low-cost, safe fuel methods for control are always in demand by the aerospace and transportation industries. In particular satellite control systems, unmanned vehicle control systems, and auto airbag initiation.

REFERENCES:
1. http://www.freshpatents.com/Electrically-controlled-solid-propellant-dt20060119ptan20060011276.php

2. http://www.stormingmedia.us/64/6495/A649553.html

KEYWORDS: hypersonic, propellant, insensitive, divert attitude control system, electrically controlled, extuinguishible, exoatmospheric

TPOC: Adam R. Jones
Phone: (540) 653-4561
Fax:
Email: adam.r.jones@navy.mil
2nd TPOC: Arthur Mabbett
Phone: (540) 653-2031
Fax: (540) 653-7706
Email: arthur.mabbett@navy.mil

N06-182 TITLE: Solid-State, High-Frequency, Three-Phase Cycloconverter

TECHNOLOGY AREAS: Electronics, Weapons

ACQUISITION PROGRAM: PEO IWS 2.0, ACAT II - NULKA

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OBJECTIVE: To develop the electronics and controls for a low-distortion, quiet, and reliable output three-phase 0-to 20-kiloHertz (kHz) power converter with current 0 to 50 kiloAmperes (kA). The output frequency and current must be able to vary from minimum to maximum within a 300-millisecond (msec) time period.

DESCRIPTION: With the advancement of high-power, solid-state switching Insulated Gate Bipolar Transistors (IGBTs), the feasibility of developing a high-frequency, variable frequency, and current cycloconverter for extremely high-speed linear synchronous motors becomes feasible. These motors could be used for a variety of applications such as launch-assist of decoys, missiles, unmanned aerial vehicle (UAV) aircraft and torpedoes; thereby, eliminating the need for burning material and steam to provide the ejection force necessary to launch these vehicles. This particular capability would enhance the safety and reliability of launch systems.

PHASE I: To investigate the feasibility of extending the solid-state, high-frequency power converters from 400 Hz to 20 kHz and higher with the required combined current output. Based on analysis, develop a cycloconverter design to meet needs detailed above.

PHASE II: To develop a prototype system to achieve the desired three-phase variable frequency and current output within the 300-msec time period. Demonstrate the performance meets the objectives.

PHASE III: To transition technology to develop an extremely high-speed mass launcher and demonstrate the system's effectiveness onboard ship during sea trials.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Technologies developed are applicable to commercial transportation and logistics.

REFERENCES:
1. Ian S. Roth, Marcel P.J. Gaudreau, Michael A. Kempkes, Timothy J. Hawkey, and J. Michael Mulvaney, "Solid-State High Frequency Power Converters", Diversified Technologies, Inc., Bedford, MA.

2. Henry Kolm, Kevin Fine, Fred Williams, and Peter Mongeau, "Electromagnetic Guns, Launchers, and Reaction Engines", MIT, Francis Bitter National Magnet Laboratory, Boston, MA, 1980.

3. J. R. Powell and G. T. Danby, "The Linear Synchronous Motor and High Speed Ground Transport", 6th International Energy Conversion Engineering Conference, Boston, MA, 1971.

4. H. H. Kolm and R. D. Thornton, "The Magneplane: Guided Electromagnetic Flight", Proc. 1972 Applied Superconductivity Conference, Annapolis, IN, 1972.

5. G. K. O'Neil, "The Colonization of Space", Physics Today, Vol. 27 No. 9, Sept 1974.

KEYWORDS: Power conversion, solid-state, cycloconverter, variable-frequency, variable current

TPOC: Frank Mansfield
Phone: (540)653-3422
Fax:
Email: francis.mansfield@navy.mil

N06-183 TITLE: Hypersonic Airframes with Integral Thermal Protection

TECHNOLOGY AREAS: Air Platform, Materials/Processes, Space Platforms, Weapons

ACQUISITION PROGRAM: PEO IWS, Naval Surface Fire Support Program (IWS 3C).

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OBJECTIVE: Develop low-cost, high-performance hypersonic airframes with an integrated thermal protection system.

DESCRIPTION: Hypersonic launch and flight of projectiles subjects their airframes to severe in-bore launch dynamics followed by thermal shock and loading. Heat soak into internal components such as temperature-sensitive inertial measurement units further exacerbates the severe flight environment. Historically expensive exotic materials have been used for these thermal protection systems (TPS) typically as an added component to the airframe. A low cost composite material airframe would require a very high specific strength, in both axial and lateral directions while customizing thermal properties at key airframe locations such as the nose tip. The customized thermal regions would need to survive severe thermal shock and maintain structural integrity at high temperatures. The lower weight composite materials will minimize the parasitic mass and volume of the airframe thus maximizing the lethal payload volume. Aluminum metal matrix composites are not an option since they cannot sustain the aerothermal loading. Innovative high temperature and high specific strength composites are required.

PHASE I: Develop a material that is inexpensive to produce, launch survivable, thermally viable, and of relatively low density. Specifically, the airframe must not plastically deform under accelerations of 50 kG in set back and 12.5 kG in both balloting and set forward; the airframe melt temperature must be at least 2000+ °K at the nose tip, able to withstand thermal shock of 1000 °K/s, possess a very low thermal conductivity; and the density should be 5 g/cc or less in order to preserve volume and mass for the lethal payload. The contractor shall fabricate samples and test material properties.

PHASE II: Fabricate cone-shaped airframe prototypes and demonstrate gun-launch survivability via air- or chemical-gun launches. Test instrumented prototypes in an arc jet facility to measure heat soak throughout airframe and into internal cavity.

PHASE III: In FY04, the Office of Naval Research embarked on an Innovative Naval Prototype for an Electromagnetic Gun System. Concept hypersonic flight demonstrations will occur in which a series of saboted airframes will be both chemically and electromagnetically launched. The contractor will provide saboted airframes throughout the test series. Successful demonstrations will facilitate transition into the follow-on System Development & Demonstration Acquisition Program sponsored by NAVSEA IWS3C.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Low-cost, light-weight, high-strength and high-temperature components are always in demand by the aerospace and transportation industries. In particular rocket nozzles, throats, and potentially combustion chambers can significantly reduce the parasitic mass of the rocket system.

REFERENCES:
1. http://www.globalsecurity.org/space/systems/sov.htm

2. http://www.icase.edu/workshops/hress01/presentations/dicus.pdf

KEYWORDS: hypersonic, airframe, aerothermal, thermal protection, thermal shock, thermal soak, thermal loading

TPOC: Arthur Mabbett
Phone: (540)653-2031
Fax: (540)653-7706
Email: arthur.mabbett@navy.mil
2nd TPOC: Adam R. Jones
Phone: (540)653-4561
Fax:
Email: adam.r.jones@navy.mil

N06-184 TITLE: Application of Advanced Materials for High Volatility Fuel Management

TECHNOLOGY AREAS: Ground/Sea Vehicles, Materials/Processes

ACQUISITION PROGRAM: PEO SHIPS – Littoral Combat Ship (PMS501) - ACAT-1D

OBJECTIVE: Develop advanced materials, sensors, and reactive containment systems to support the stowage, transport, and utilization of high volatility liquid fuels.

DESCRIPTION: High volatility fuels pose a challenge across DoD in that storage, transport, and transfer by conventional means entails increased risk of fire, explosion, and vapor migration. Despite these challenges, the advantages of special fuels make them attractive for a variety of applications. This topic is focused on the development of advanced materials with properties optimized for the management of volatile fuels. Solutions should address full lifecycle handling of these fuels from long duration static storage, through transport by various means, to dispensing and utilization. Primary focus should be on reducing inherent risks, including isolation from external activating events, alertment of enabling conditions, and containment and mitigation of fire, explosion, and vapor effects.

PHASE I: Demonstrate the feasibility of a detailed concept that supports the topic's objectives. Assess relative performance metrics for each proposed technology to support selection of an optimal solution for volatile fuel storage, transport, and dispensing with appropriate risk factors. Provide detailed material concept recommended for further development based on results.

PHASE II: Develop detailed material system plans for the intended applications. Conduct material technology and system development, including production and handling processes. Produce prototype material system and characterize performance and risks in simulated volatile fuel storage, transport, and dispensing applications.

PHASE III: Working with the Navy, integrate SBIR products into shipboard and independent systems. Develop transition plans and support demonstration of final system performance in volatile fuel management.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: High volatility fuels are in widespread use through every sector of the commercial marketplace, often with corresponding increase in the risk of a catastrophic event. Resulting material technologies that substantially lower that risk will be valuable in improved safety and reduced losses. This technology will also be an enabler for wider use of COTS engines for military applications.

REFERENCES:
Available at http://www.navysbir.com/ via the SBIR/STTR Interactive Topic Information System (SITIS) web link

1. "Interface Control Document (ICD) for Littoral Combat Ship (LCS) Flight Zero Reconfigurable Mission Systems," Baseline 1.0, 18 February 2005

2. Stowage, Handling and Disposal of Hazardous General Use Consumables, NSTM Ch 670-4.7.2, Rev. 3, 1 May 1997

KEYWORDS: Volatile fuels, storage, transport, dispensing, advanced materials

TPOC:	Larry Murphy
Phone:	(301)227-3664
Fax:	(301)227-3396
Email:	murphylp@nswccd.navy.mil
2nd TPOC:	Ken Montgomery
Phone:	(202)781-2601
Fax:	(202)781-4778
Email:	kenneth.montgomery@navy.mil

N06-185 TITLE: Persistent Deployable Communications Network for Unmanned Vehicles

TECHNOLOGY AREAS: Air Platform, Ground/Sea Vehicles, Battlespace, Weapons

ACQUISITION PROGRAM: PMS 420 LCS Mission Modules

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OBJECTIVE: To develop a persistent high data rate communications network using autonomous deployment vehicles caring the Joint Tactical Radio System (JTRS) to provide reliable communications among unmanned underwater, (water) surface, ground, and air vehicles (respectively, UUVs, USVs, UGVs, and UAVs).

DESCRIPTION: Unmanned systems are more frequently being used to provide persistent littoral surveillance for a broad range of missions. As these missions increase in complexity, multiple unmanned vehicles of different classes will be needed to work cooperatively over large distances to accomplish them. Current satellite communication systems do not provide sufficient bandwidth or low latency for cooperative unmanned vehicle mission needs. Line of sight communication systems are suitable, but only have a limited range. The next generation radio under development, Joint Tactical Radio System (JTRS), will have a network communications mode. This mode will allow for radios to be linked together to form a network and extend the range of the line of sight communications of the system. Innovative ideas are needed for a persistent deployed system for JTRS radios (or another Navy network radio) to provide reliable coverage of a 75 x 75 square nautical mile area or larger for a high data rate organic communications system for unmanned vehicles and manned platforms. The Littoral Combat Ship (LCS) is designed to launch and recover UUVs, USVs, and UAVs. LCS will need an organic, high data rate, over the horizon communications capability to support its fleet of unmanned vehicles and deployed sensors. This organic communications system would allow for: raw data to be transmitted back to LCS for processing from deployed sensors and vehicles, increased command and control of multiple over-the-horizon unmanned vehicles, and the ability for cooperative autonomy among unmanned vehicles leading to increase mission effectiveness in complex environments. Technology solutions could range from but are not limited to station keeping buoys, underwater gliders, air gliders, USVs, UAVs, station keeping balloons, automated control system, etc.

The system should have enough battery power to maintain communications for the radio and station keeping ability for at least four 4 days. The system should provide constant reliable communication for a 75 x 75 square nautical mile area over both land and sea. The system should be low cost and deployable and recoverable by LCS with minimal effort. The system should have minimal impact to LCS which includes space, weight, and little personnel requirements using automation to manage or control the communications network.

The deployment systems should
- Be capable of four days operation (threshold) to seven days operations (objective)
- Provide reliable communications in a 75 x75 square nautical mile operating area
- Provide stability and antenna space to allow 1 Mb/s data transfer rate bi-directional communications
- Minimize size and weight of the system aboard LCS

PHASE I: Develop a concept design for a deployable device(s) that can carry the JTRS radio, antennas, power, and control system. The design should show the link budget to ensure area coverage, CONOPS for deployment and recovery from an LCS like ship, preliminary design of the system, command and control strategy, and the ability to provide coverage for at least four days.

PHASE II: The Phase II effort should be the development of a prototype system for test. This test shall include a demonstration of a 25x 25 square nautical mile operating area as well as deployment and recovery of the device from a boat.

PHASE III: Integrate and test of the system onto LCS for a demonstration of reliable communications over 75 x 75 square nautical mile for four-plus days. This will include deployment and recovery of the mechanism from LCS

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: This technology could have significant impact on to the cellular phone and data industry. The ability to rapidly deploy a network could change the industry. It could move from tower based system, which has reception problems, to unmanned systems which could be more robust and cheaper. This technology also has humanitarian and homeland defense potential applications to bring in a temporary network to supplement a damaged one until repairs can be made.

REFERENCES:
1. The Navy UUV Master Plan. April 20, 2000 http://www.auvsi.org/resources/UUVMPPubRelease.pdf

2. The Navy UUV Master Plan. November 9, 2004. http://www.chinfo.navy.mil/navpalib/technology/uuvmp.pdf

KEYWORDS: communication network, buoys, unmanned vehicles, control systems, LCS

TPOC:	Daniel Deitz
Phone:	(202)781-2670
Fax:	
Email:	daniel.deitz@navy.mil
2nd TPOC:	Cecil Whitfield
Phone:	(202)781-4454
Fax:	(202)781-4695
Email:	whitfieldcl@navsea.navy.mil

N06-186 TITLE: Compact, lightweight sensor handling system for unmanned vehicles

TECHNOLOGY AREAS: Ground/Sea Vehicles, Sensors, Weapons

ACQUISITION PROGRAM: PMS 403 Unmanned Undersea Vehicles

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), which controls the export and import of defense-related material and services. Offerors must disclose any proposed use of foreign nationals, their country of origin, and what tasks each would accomplish in the statement of work in accordance with section 3.5.b.(7) of the solicitation.

OBJECTIVE: To develop a lightweight sensor handling system for common use by unmanned surface vehicles or common use by unmanned undersea vehicles in deploying, towing, and recovering a variety of sensor and similar systems.

DESCRIPTION: Notes. In this context, handling means deployment, towing, and retrieval as required. Proposals should address either a system for Unmanned Undersea Vehicles (UUVs) or a system for Unmanned Surface Vehicles (USVs). Both should not be addressed in one proposal. It is anticipated that at least one award will be made for each type of vehicle, assuming the quality of proposals warrant that approach.

Unmanned systems are increasingly being used for a broad range of missions in the littoral, including antisubmarine, antisurface, and mine warfare. To achieve the missions, Unmanned Surface Vehicles (USVs) or Unmanned Underwater Vehicles (UUVs) will be required to deploy a variety of systems including towed arrays, dipping sonars, towed active sonars such as sidescan or variable depth broadband, sweep systems, and others to be determined. Currently, each unmanned system is designed with its own handling gear to deploy sensors. With the limited space aboard LCS and the high life cycle cost of maintaining various unmanned vehicles for each mission requirement, PEO LMW is moving towards a small set of unmanned surface and undersea vehicles with a number of common subsystems. The concept of a common sensor deployment system for each type of unmanned vehicle conforms to this vision.

The handling system should contain a winch, tow cable, modular waterproof connector, and platform interfaces. Designs should be developed for the most difficult case: the smallest UUV or USV expected to be used for sensor deployment and retrieval.

Developing the desired system provides many technical challenges. For UUVs, two principal challenges are size and weight. UUVs are traditionally power limited but have the advantage of operating at the depths at which deployed sensors are used. For UUVs, technical development is needed to produce a very thin, light weight tow capable with the ability to provide power to a deployed sensor and bi-directional high data rate communications. The whole UUV system should be waterproof to a depth of 1000 feet.

USVs, depending on platform size, may not be power limited but face a significant challenge in keeping sensors at the desired depth. A very thin, lightweight sensor handling system with the ability to provide power to a deployed sensor and bi-directional high data rate communications is contrary to conventional surface platform design principles which require a heavy tow cable or a depressor tow body to achieve depth. Innovative approaches are required. One approach might be a propelled tow body (powered through the tow cable) which achieves depth with forward thrust instead of weight or downward lift. The USV system should be designed for maximum optimization of speed and depth. High speed operations are not envisioned.

PHASE I: Develop a conceptual design of an innovative compact towed sensor handling system, including a tradeoff studies showing reduction in size and weight of the system.

PHASE II: Develop and test a prototype system of the compact towed handling system. For USV application, the system should capable of fitting on top a 7M RHIB boat for testing purposes. For best transition to UUV application, the system should fit in a 2’x 4’ x 4’ flooded space with 120V power being provided by the UUV.

PHASE III: Integrate and test of the system onto the Large Displacement Mission Reconfigurable UUV System (LD MRUUVS) acquisition program and or low speed USV program. The possibility exists of conducting a joint demonstration of the Phase II technology with the Australian government’s Defence Science and Technology Office aboard one of their 7 M RHIBs.

PRIVATE SECTOR COMMERCIAL POTENTIAL: This technology would reduce the complexity of the systems being deployed and decrease cost while increasing operational effectiveness and flexibility. This technology would have applications in the oil and gas industry for conducting surveys where multiple sensors are needed. For the same reasons, the technology would have many applications to homeland defense.

REFERENCES:
1. The Navy UUV Master Plan. April 20, 2000 http://www.auvsi.org/resources/UUVMPPubRelease.pdf

2. The Navy UUV Master Plan. November 9, 2004. http://www.chinfo.navy.mil/navpalib/technology/uuvmp.pdf

KEYWORDS: UUV, USV, sensors, towed arrays, cable, winch

TPOC: Daniel Deitz
Phone: (202)781-2670
Fax:
Email: daniel.deitz@navy.mil

N06-187 TITLE: IMPROVED AND INNOVATIVE COOLING GARMENTS FOR EMERGENCY RESPONDERS

TECHNOLOGY AREAS: Materials/Processes, Human Systems

ACQUISITION PROGRAM: PM ICE (Individual Combat Equipment) & PM NBC

OBJECTIVE: Identify and design improved and innovative cooling garments for Navy / Marine Corps emergency responders (EOD Techs, SRT Members, etc).

DESCRIPTION: A HAZMAT team will spend, on average, 30 - 60 minutes in a hazardous situation encumbered by chemical/biological Personal Protective Equipment (PPE), while a USMC Special Reaction Team (SRT) member may spend many hours in a challenging operational environment. It is well documented that working in extremely hot environments leads to reduced physical and cognitive performance. A cooling garment is needed that be integrated with other gear that an emergency responder wears - body armor, level A protective gear, or turnout gear, and work properly without producing pressure points which irritate the user. Integration and use with the many varieties of body armor is a major issue with users. The garment must not be bulky and should not be more than ¼ inch thick. For SRT operations, the cooling system should not emit an audible noise beyond a distance of 15 feet.

The cooling garment should not have to be assembled on site, must be easily donned by users with their operational gear, and easily removed. It must be self-contained. The garment should be rechargeable in the field using readily available means while being worn by the user, preferably recharged by the wearer. Any battery power should use common battery types. Support equipment should be minimal in size, rugged, and power compatible with standard response vehicle power. Testing should be easily accomplished to ensure its operational capability. Cleaning should be done using water-based methods.

Research on innovative designs can include new materials, novel cooling systems and methods of integration with existing PPE. Research on improving existing systems is also acceptable. Examples of research areas are: 1) Research on improving the component-level performance of vapor compression systems, specifically compressor performance and gas-side heat exchanger specific conductance. 2) Research in the limitations of magnetic cooling including the size of the magnets required, their support structure, and the potential EMI problems with this cycle. 3) Research in the development of an evaporative cooling system coupled with a desiccant wheel and a regenerative heat exchanger, specifically the component level design, demonstration of the system and a detailed analysis of the mass of filter material required.

PHASE I: Identify and specify the design of an improved or innovative cooling garment that meets weight requirements (3-5 lbs), cooling requirements (minimum 200 BTU/hr for 65-85 degrees F and 425 BTU/hr for 70-120 degrees F), and power requirements (10 W for 65-85 degrees F and 35 W for 70-120 degrees F). The design must permit the removal of perspiration-generated moisture from the body and not contain toxic materials.

PHASE II: Develop a working model and production process for the manufacture of the cooling garment. The design and working model must take into account the surface temperature of the skin/cooling system interface, the flow rate of the active systems, the inlet temperature for active systems, the heat capacity of the heat sink, the metabolic rate of the user and clothing, and environmental factors.

PHASE III: The technology successfully developed in this project will have multiple military and commercial applications, including PPE applications, sports, and extreme weather applications.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The technology successfully developed in this project will have multiple commercial applications, including PPE applications, sports, and extreme weather applications.

REFERENCES:
1. "CBIRF Responds to Ricin Scare, Helps Secure Federal Buildings", Cpl. Clinton Firstbrook, Headquarters Marine Corps Story Identification #: 2004211151659, www.usmc.mil/marinelink

2. Physical Work and Cognitive Function During Acute Heat Exposure Before and After Heat Acclimation, Patterson, MJ, Taylor, NAS and Amos, D: June 1998 DSTO-TR-0683

3. Medical Aspects of Harsh Environments, Volume 1 (Textbooks of Military Medicine) by Pandoff, Kent B. & Burr, Robert E; Office of the Surgeon General, Falls Church, VA, 2003

KEYWORDS: cooling garment, personal protective equipment, materials, microclimate cooling

TPOC: Billy Short
Phone: 703-696-6993
Fax:
Email: shortb@onr.navy.mil
2nd TPOC: CDR Dylan Schmorrow
Phone: 703-696-0360
Fax:
Email: schmord@onr.navy.mil